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Multimodality CMR detection of coronary artery disease in patients with heart failure and depressed systolic function: superiority of coronary MRI compared to late gadolinium enhancement

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Introduction

Heart failure (HF) with depressed systolic function is increasingly prevalent in the United States with coronary artery disease (CAD) the most common etiology. Definitive determination of an ischemic vs. non-ischemic etiology of HF often requires invasive x-ray coronary angiography. Both coronary magnetic resonance imaging (cMRI) and late gadolinium enhancement (LGE) have shown promise in the non-invasive detection of CAD in HF patients.

Purpose

We hypothesized that the combination of cMRI and LGE would have superior performance to either test alone.

Methods

We studied a consecutive series of patients with depressed left ventricular ejection fraction (≤ 40%) who underwent both cMRI and LGE. cMRI evidence of CAD in a territory that matched the wall motion abnormalities or subendocardial LGE was considered evidence of CAD. For combined assessment, evidence of CAD by either test was considered a positive result.

Results

A total of 106 subjects were included (52 ± 17 yrs; 62 men, LVEF median 30%, range 10-40%). CAD risk factors included diabetes (n = 25 [24%]), hypertension (n = 41 [39%]), and dyslipidemia (n = 37 [35%]). X-ray angiographic evidence of CAD or documented myocardial infarction was present in 24 (23%). The cause of HF in the remaining subjects was idiopathic in 54 (51%), cardiotoxic chemotherapy in 8 (8%), hypertension in 6 (6%), and other causes in 14 (13%). Interpretable cMRI were obtained in 97 (92%) subjects and interpretable LGE in 102 (96%) subjects. The test characteristics for cMRI alone, LGE alone, and combined assessment are shown in Table 1. cMRI alone had superior sensitivity, specificity, positive predictive value and negative predictive value compared to LGE. The addition of LGE to cMRI data decreased specificity and positive predictive value.

Conclusion

Among patients with depressed LVEF, cMRI is superior to LGE alone or a combined assessment in characterizing ischemic vs. non-ischemic etiologies of HF with depressed systolic function.

Table 1: Test characteristics for the detection of CAD

	cMRI (N = 97)	LGE (N = 104)	Combined Assessment (N = 106)
Sensitivity	100%	79%	100%
Specificity	93%	85%	77%
Positive Predictive Value	82%	61%	56%
Negative Predictive Value	100%	93%	100%